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COMPOSITION AND STOCKING OF THE YOUNG STAND 35 YEARS AFTER A SELECTIVE CUTTING IN PONDEROSA PINE

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An important objective in forest management is to obtain adequate natural regeneration of desired species following harvesting of the tree crop.

One example of natural regeneration following selective cutting is available from a study made of a ponderosa pine stand in Lick Creek on the Bitterroot National Forest. This stand, prior to cutting between 1907 and 1911, was composed of 90 percent ponderosa pine and 10 percent Douglas-fir by volume. Intensity of cutting was variable and resulted in leaving a reserve stand that ranged from 5 to 50 percent of the original volume. All merchantable Douglas-fir was cut. Horse logging was used over the major portion of the area and slash was disposed of by piling and burning currently with the logging operation. Area in the cut-over stand is shown in table 1.

Table 1.--Area by reserve stand and aspect

Aspect	Area by reserve volume classes 1/ in board feet			
	500	2500	5000	9000
	Acres	Acres	Acres	Acres
Southerly	278	398	579	143
Northerly	34	172	246	65

1/ Actual class midpoints 627, 2396, 4655, and 9089 board feet for the 500, 2500, 5000, and 9000 board foot classes. Rounded off values are used for convenience in discussion.

Ponderosa pine and Douglas-fir are the principal species found in the present young stand. Grand fir and lodgepole pine are present in small numbers.

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RESULTS

Composition of reproduction.

Aspect was found to be an important environmental factor influencing the composition of the young stands. Douglas-fir generally exceeded ponderosa pine trees per acre on northerly aspects (table 2), while on southerly aspects there was a greater number of ponderosa pine trees in the young stand.

Table 2.--Number of trees per acre in the present young stand by aspect, size class, species, and reserve volume 1/

Reserve volume class	Northerly aspects				Southerly aspects			
	Reproduction 2/		Poles 3/		Reproduction		Poles	
	PP	DF	PP	DF	PP	DF	PP	DF
(Board feet)	No.	No.	No.	No.	No.	No.	No.	No.
500	691	118	162	51	663	213	55	33
2500	762	1554	9	125	735	394	33	58
5000	644	1276	24	68	666	340	34	25
9000	841	1185	8	102	507	343	26	52

1/ Basis - trees up to 5.5 inches d.b.h., 927 plots 1/250 acre in area; trees 5.6 inches to 9.5 inches d.b.h., 927 plots 1/10 acre in area.
2/ Reproduction includes seedlings and saplings up to 3.5 inches d.b.h.
3/ Poles 3.6 - 9.5 inches d.b.h.

On northerly aspects, Douglas-fir gained its advantage over pine because: (1) it is relatively more tolerant than pine and got started earlier (see figure 1), and (2) conditions on north slopes are more favorable for its initial establishment than on southerly aspects. Logging created a condition that was favorable for establishment of pine reproduction, as shown by number of trees per acre in table 2, but advance Douglas-fir reproduction and more prolific and earlier seeding-in of Douglas-fir following logging has resulted in a young stand that has a high proportion of Douglas-fir.

Ponderosa pine and Douglas-fir advance reproduction became established in a similar pattern on southerly aspects (figure 1). This similarity is reflected in pole stands (table 2) that are essentially equal. Number of trees in the reproduction stand is consistently greater for ponderosa pine than for Douglas-fir on all areas on southerly aspects. These aspects, particularly after the site is exposed by logging, are probably less favorable for Douglas-fir establishment. As a result, ponderosa pine reproduction is greater than Douglas-fir.

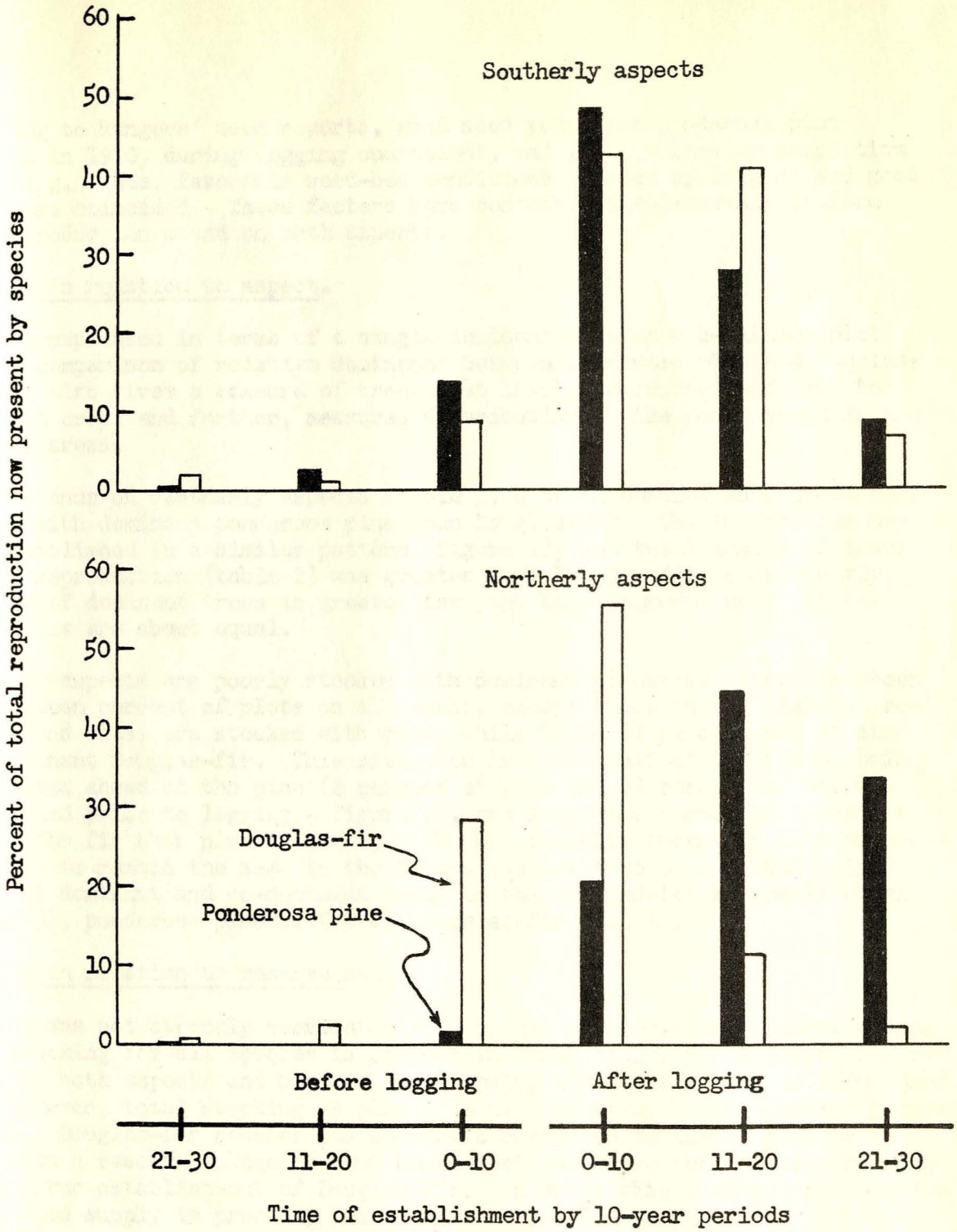

Figure 1.—Time when present reproduction stand became established.

According to Rangers' seed reports, good seed years for ponderosa pine occurred in 1910, during logging operations, and 1912, following completion of logging. Thus, favorable seed-bed conditions created by logging and good seed years coincided. These factors have contributed to somewhat uniform pine reproduction stand on both aspects.

Stocking in relation to aspect.

Stocking expressed in terms of a single dominant tree on a 4-milacre plot gives a comparison of relative dominance between ponderosa pine and Douglas-fir. It also gives a measure of trees most likely to succeed and grow to the final crop, and further, measures distribution of the young stand in the cut-over areas.

On all stands on southerly aspects (table 3) 4 to 14 percent more plots were stocked with dominant ponderosa pine than Douglas-fir. The two species became established in a similar pattern (figure 1), but total number of trees of pine reproduction (table 2) was greater than Douglas-fir; consequently, stocking of dominant trees is greater for pine because growth rates of the two species are about equal.

Northerly aspects are poorly stocked with dominant ponderosa pine. Thirteen to seventeen percent of plots on all areas, except those in the lightest reserve stand class are stocked with pine, while 55 to 71 percent are stocked with dominant Douglas-fir. This situation is the result of the fir becoming established ahead of the pine (2 percent of pine and 31 percent of fir was established prior to logging - figure 1), and a greater number of trees per acre of the fir than pine (table 2). The relationship shown for both aspects is likely to remain the same in the future, as relative mean annual height growth of dominant and co-dominant trees of the two species is nearly equal; for age 35, ponderosa pine 0.62 feet, Douglas-fir 0.64 feet.

Stocking in relation to reserve stand.

Stocking was not strongly correlated with volume or density of reserve stand. Total stocking for all species is poorest in areas having the lightest reserve volume on both aspects and best in areas having a reserve volume of 2500 board feet; however, total stocking is almost as high on areas having heavier reserve volumes. Douglas-fir reaches its maximum stocking on southerly aspects on areas with a reserve volume of 9000 board feet; evidence that heavier reserve stands favor establishment of Douglas-fir. On areas with a very light reserve stand, seed supply is probably inadequate and poorly distributed.

Table 3.--Stocked ¼-milacre plots by dominant tree of the young stand, by aspect and reserve volume classes.

Aspect	Species	Stocking by reserve volume classes in board feet			
		500	2500	5000	9000
		Percent	Percent	Percent	Percent
Southerly	Ponderosa pine	29	39	39	37
	Douglas-fir	19	29	25	33
	Other 1/	4	3	3	0
	Total	52	71	67	70
Northerly	Ponderosa pine	35	13	17	16
	Douglas-fir	18	71	55	62
	Other	0	6	10	3
	Total	53	90	82	81

1/ Includes lodgepole pine and grand fir.

CONCLUSIONS

Results of this study emphasize certain factors which contribute to or hinder successful regeneration of ponderosa pine following harvesting of the mature crop:

(1) On northerly aspects, Douglas-fir attained a dominant position in the young stand because of earlier establishment on the area and more stems on each acre.

(2) Ample pine stems exist on northerly aspects, but the large proportion of Douglas-fir in a dominant position precludes ponderosa pine becoming the principal species in the final crop. Measures such as weeding out overtopping Douglas-fir are needed to favor the pine.

(3) Southerly aspects are more favorably stocked with ponderosa pine; however, there is an apparent increase of Douglas-fir on these aspects as compared to the original stands. Advance Douglas-fir reproduction has contributed materially to this change.

(4) Logging improved conditions for establishment of reproduction.

(5) Good seed crops coincident with cutting operations appeared to aid prompt regeneration.